



# Introduction to Manufacturing

Career Cluster	Manufacturing
Course Code	13002
Prerequisite(s)	None
Credit	.5 per semester
Program of Study and Sequence	Foundation courses – <b>Introduction to Manufacturing</b> – entry pathway course in any of four manufacturing pathways
Student Organization	Skills USA
Coordinating Work-Based Learning	Field trips or guest speakers
Industry Certifications	Options of OSHA 10, AWS SENSE Certification, or AWS Safety Certification
Teacher Certification	7-12 Technology Education; STEM Cluster Endorsement; Engineering & Robotics Pathway Endorsement; Manufacturing Cluster Endorsement
Resources	

## Course Description:

Introduction to Manufacturing provides entry level exposure and career exploration in the manufacturing industry. This comprehensive course teaches students the various methods used to process and transform materials. Includes skills common to all manufacturing occupations such as reading working drawings, safety, hand and power tools, bonding casting, forming computer automations, LEAN manufacturing, soldering, metallurgy, and various welding processes. Students will learn the business and design process of manufacturing industry.

Planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.

**Suggested Grade Level:** 9 – 12

**Topics Covered:**

- Career Exploration
- Manufacturing Business Processes
- Safety and Environmental Practices
- Ethics in the workplace
- Basic Tools & Equipment used in the Manufacturing Industry
- Manufacturing Processes
- Design Process

**Program of Study Application**

Introduction to Manufacturing is a cluster course in the Manufacturing program of study. Upon completion of Introduction to Manufacturing, a student will be prepared to take an entry pathway course in any of the four manufacturing pathways: welding, machining, design/engineering, or automation.

**Course Standards****IM 1: Career exploration and development.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
One Recall	IM 1.1 Recognize the various career pathways/occupations that are available in manufacturing process/industry/business.	SD MyLife @ <a href="http://sdmylife.com/">http://sdmylife.com/</a>  Or other career exploring programs
Four Extended Thinking	IM 1.2 Design a career path for individual career interest in the manufacturing cluster.	Career Pathways <ul style="list-style-type: none"> <li>• Welding</li> <li>• Machining</li> <li>• Design/Engineering</li> <li>• Automation</li> </ul>

**Notes**

**IM 2: Plan, manage and perform the processing of materials into intermediate or final products and understand related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
Three Strategic Thinking	IM 2.1 Develop a business plan for manufacturing operations. Examples: Summarize how planning a budget is used in manufacturing and/or business. Identify the roles and functions of government in regulating and supporting manufacturing business	Writing a Business Plan South Dakota Business Help @ <a href="http://sdbusinesshelp.com/">http://sdbusinesshelp.com/</a> South Dakota Manufacturing and Technology Solutions <a href="http://sdmanufacturing.com/">http://sdmanufacturing.com/</a>
One Recall	IM 2.2 Explain trends and issues in the manufacturing industry.  Examples: <ul style="list-style-type: none"> <li>- SWOT analysis of various products and/or manufacturing companies.</li> <li>- Compare how social and economic changes have had an effect on business and various manufacturing processes.</li> <li>-Describe the cause and effect of risk management as it relates to a business or manufacturing process.</li> </ul>	Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis
Three Strategic Thinking	IM 2.3 Demonstrate a management plan for the manufacturing process for the production of a product and/or business  Example: Summarize how material controls are related to the production of products. Identify and apply accounting procedures.	LEAN Manufacturing Principles LEAN Manufacturing Principles @ <a href="http://www.sdmanufacturing.com/services/lean/">http://www.sdmanufacturing.com/services/lean/</a>

## Notes

**IM 3: Implement manufacturing technology safety practices.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
One Recall	<p>IM 3.1 Maintain general safety in accordance with government regulations, health standards, and company and/or school policy.</p> <p>Example: Identify state, federal and local worker safety, health and environmental regulations including correct use and storage of hazardous materials according to current safety standards.</p>	<p>American Welding Society- School Excelling through National Skills Standards Education- (AWS SENSE) Safety Certification @ <a href="http://awo.aws.org/sense/">http://awo.aws.org/sense/</a></p> <p>AWS Safety Certification @ <a href="http://awo.aws.org/seminars/safety/">http://awo.aws.org/seminars/safety/</a></p> <p>Occupational Safety and Health Administration OSHA10 @ <a href="http://www.careersafeonline.com/index.php/component/content/article/9-courses/36-osh-10-hour-construction-industry">http://www.careersafeonline.com/index.php/component/content/article/9-courses/36-osh-10-hour-construction-industry</a></p> <p>Safety Data Sheet (SDS)</p>
Two Skill/Concept	IM 3.2 Evaluate ergonomic factors associated with the manufacturing industry.	

**Notes**

Career Cluster: Manufacturing

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**IM 4: Apply ethical practices in the workplace as they relate to today's society.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
One Recall	IM 4.1 Identify and display professional practices in the workplace.	Student Handbook Classroom Rules American College Testing Program (ACT) KeyTrain Soft Skills Suite @ <a href="http://www.keytrain.com/softskills.asp">http://www.keytrain.com/softskills.a sp</a>

**Notes**

**IM 5: Utilize the appropriate tools and equipment used in the manufacturing industry.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
Two Skill/Concept	IM 5.1 Use basic tools and equipment common to the manufacturing processes.	

**Notes**

**IM 6: Differentiate among a variety of manufacturing industries.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
	<p>IM 6.1: Research and understand basic concepts of the manufacturing career pathways. • Welding • Machining • Design/Engineering • Automation</p> <p>Examples:</p> <p>Describe:</p> <p>Electron theory and the related laws that apply.</p> <p>Basic hydraulic and pneumatic systems and the related laws that apply. Concepts and usage of robotics/automation.</p> <p>Welding procedures for various materials.</p> <p>Various material joining processes.</p> <p>Machining procedures for various materials/processes.</p> <p>Application of basic mechanical physics.</p> <p>How various materials (recyclable, ferrous/nonferrous, and synthetic) are produced and used.</p> <p>The impact of emerging technologies.</p> <p>Basic metallurgy and metal processing.</p>	<p>Standards from all Manufacturing courses.</p> <p>Resources for the Examples:</p> <ul style="list-style-type: none"> <li>• Ohm's/Watt's Law Video link- <a href="https://www.youtube.com/watch?v=Cztl0re5Eo">https://www.youtube.com/watch?v=Cztl0re5Eo</a></li> <li>• Coulomb's Law Video link- <a href="https://www.youtube.com/watch?v=gKKCcIzLHFU">https://www.youtube.com/watch?v=gKKCcIzLHFU</a></li> <li>• DC Circuit Laws Video link- <a href="https://www.youtube.com/watch?v=u0ZIARKFQBU">https://www.youtube.com/watch?v=u0ZIARKFQBU</a></li> <li>• Kirchoff's Law Video Link- <a href="https://www.youtube.com/watch?v=0gRtVz4XrZM">https://www.youtube.com/watch?v=0gRtVz4XrZM</a></li> <li>• Voltage Divider Rule Video Link- <a href="https://www.youtube.com/watch?v=rIEnMpgIaU4">https://www.youtube.com/watch?v=rIEnMpgIaU4</a></li> <li>• Boyle's Law Video Link- <a href="https://www.youtube.com/watch?v=oiMMJJH8Phs">https://www.youtube.com/watch?v=oiMMJJH8Phs</a></li> <li>• Bernoulli's principles Video Link- <a href="https://www.youtube.com/watch?v=8vqMotb6m3c">https://www.youtube.com/watch?v=8vqMotb6m3c</a></li> <li>• Newton's Laws of Motion and Forces Video Link- <a href="https://www.youtube.com/watch?v=NYVMImLOBPQ">https://www.youtube.com/watch?v=NYVMImLOBPQ</a></li> </ul>

**Notes**

**IM 7: Design and create a product using the engineering design loop.**

<i>Webb Level</i>	<i>Sub-indicator</i>	<i>Integrated Content</i>
Three Strategic Thinking	IM 6.1 Differentiate products/components in relationship to size, proportion and tolerances.  Examples:  Read and Sketch drawings  Interpret working drawings and schematics.  Design a working drawing and/or a schematic circuit	Standards in Manufacturing Courses  ADDA Mechanical Drafting Standards  Electronics/Robotics Standards
Three Strategic Thinking	IM 7.1 Develop a prototype of a product.	Engineering Design Process
Four Extended Thinking	IM 7.2 Test and evaluate a product.	Engineering Design Process
Three Strategic Thinking	IM 7.4 Redesign product for final production.	Engineering Design Process

**Notes**